

The Halicarnassus Mausoleum, a Digital Rereading. Step 1: The Statues at the British Museum

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Well known as one of the Seven Ancient World's Wonders, the Mausoleum built by Mausolus in Halicarnassus is one of the many lost masterpieces from the past. Its architectural and artistic high quality just left a large bounce of fragments and ruins, leaving to all the scholars a rich subject for studies and to imagine possible reconstructions. In this ongoing research, a try of collecting the single parts and make some matching with other possible references is done starting from 3D digital modeling. Photogrammetry was used on a set of statues from the British Museum, for creating accurate 3D models, with a great attention in finding correspondences with other sculptures and features (faces, dresses, details) from other artworks from the same area. The use of the SfM/IM (to give it a very specific definition) [Guidi et al. 2015], commonly indicated as SfM/IM photogrammetry (tuned out again to be a great tool for rapid and accurate digitalization, all the models were then edited, simplified and uploaded to the Sketchfab platform to be a quick reference for all the participants to the research group, but also accessible to anyone for seeing and checking these interesting pieces from the past. Such an operation, starting from the statues trays to bring on some reflections about proportions, stiles and relationship with architecture to better understand and verify possible new reconstruction choices about this long lost architectural wonder.

Key words:

Mausoleum, Mausolus, Caria, Photogrammetry, Statues.

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INTRODUCTION

In the 25 years of reign of Mausolus (377-353 B.C.), the Carian countryside experienced a rapid rise to political power in the Aegean area. Mausolus was satrap under the reign of the Persian Great King and had inherited this role from his father Hekatomnos. Halicarnassus would have remained a minor city if Mausolus had not chosen it as his residence, naval base and new capital of Caria [Chandler 1775]. The construction of the Mausoleum was begun by Mausolus before his death, happened in 353 B.C., and it was completed under the supervision of his wife and sister Artemisia in 350 B.C. It is not only a monument to the beloved deceased but is, above all, a monument that represents the pride and power of the Hecatomnid dynasty that had reached the height of its power at that time [McGowan 2013].

The architects who were called to work at the Mausoleum were Pythèos (being credited with the great marble quadriga which surmounted the mausoleum) and Satyros both from Greece. The four external sides were adorned with sculptural reliefs, each created by one of four Greek sculptors Leochares, Bryaxis, Scopas of Paros and Timotheus.

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Thanks to the politics of the dynasty the local culture underwent a profound transformation which included the free circulation of different cultural backgrounds coming from neighboring societies that, through a creative interaction, produced an autonomous and constantly evolving new culture based on contrasts but also on a mixture of ideas. This mixture of cultures is well recognizable in the eclectic art of the Carian, which is characterized by a hybridization of architectural and sculptural styles due to a multiethnic society composed of Greeks, Persians and Carian. The Mausoleum, the most significant building produced in this area in this historical moment, is also the product of this hybridization of the Greek taste for sculpture and architecture and the local Persians tradition of funeral buildings [Casters 2013].

The finished structure of the Mausoleum was considered by Antipater of Sidon as one of his Seven Wonders of the Ancient World until it was probably destroyed by a series of earthquakes occurred between the 11th and the 15th century and the stones were reused in local buildings.

The Mausoleum, of which, since the excavation by Sir Charles Thomas Newton the archaeological remains are well-known, is in the last 150 years object of innumerable reconstruction attempts but, nowadays, a grave construction discovered in the middle of Mylasa, in the modern city of Milas, reopens the field to studies and comparative analyzes both about the structure and as regards the statuary and decorative apparatus of the mausoleum.

EXPLORATIONS AND SOURCES FROM HALICARNASSUS

In 1857 Sir Charles Thomas Newton (1816-1894) re-discovered the remains of the Mausoleum of Halicarnassus and the first scientific reconstruction was presented by Richard Pullan, the architect in Newton's team, in 1862. To develop a reconstruction hypothesis, he based his ideas on the preserved building blocks and the text of Plinio, in this way he defined a funerary temple characterized by a roof shaped as a high steps pyramid.

Prof. Kristian Jeppesen of the Aarhus University with his team of archaeologists, has re-excavated (1966-77) and studied, for many years, the decorative apparatus of the mausoleum, conducting surveys and making hypothetical reconstructions of the building and of the layout of the statues (combining the physical evidences from the excavations and the historic descriptions by Vitruvius¹ and Plinio²). In collaboration with the archaeologists of the local museum, he has recreated the large square so today visitors can admire the monument's excavation pit, the burial chamber, the drainage galleries, and the remaining pieces of the site.

Its architectural and artistic high quality just left a large bounce of fragments and ruins, leaving to all the scholars a rich subject for studies and to imagine possible reconstructions. Most of the decorative apparatus survived to the present day is preserved in the British Museum in London, while other parts are still in place as fragments or exhibited in the local archaeological museum.

A RECENT DISCOVERY THAT MAKES SOME DIFFERENCES

In 2010, in the city centre of the small city of Milas, Turkey (the ancient site of Mylasa), a hypogeum sepulcher was found inside a superstructure identified earlier as a temple. The discovery came after an illegal excavation in the area was noticed.

The tomb was attributed to Hecatomnus, satrap of Caria and father of the better known Mausolus. It must be reminded that the city of Milas was the capital of the Carian kingdom until the reign of Mausolus that moved it to Halicarnassus between 370 and 365 B.C.

The structure consists of a chamber tomb occulted within the structure of the funerary monument. This chamber is almost filled by the monumental sarcophagus made from a single block of white marble, carved in high relief on all the four sides.

The burial chamber is preceded by a long dromos and both rooms are covered by barrel vaults. The entrance to the subterranean area was buried under the ground level and sealed with a monolithic block of marble.

The thieves penetrated the basement of the proto-mausoleum perforating some calcareous and marble stone. They used a core drill to pierce the floor of one house that, at that time, was built over the ancient basement.

¹ Vitruvius, De Arch 2.8.10-15

² Plinio, NH 36.30-31

These clandestine excavations took place using a core drill to make holes in the masonry structures opening a passage into the hidden burial chamber. The use of the core drill also led to the use of a considerable amount of water. The liquid flowed inside the hypogean chamber to cool the cutting surfaces, impregnating the walls and damaging the ancient mural paintings.

After the archaeological discovery, the local government proceeded to expropriate all the houses built on the mausoleum and throughout the area bounded by the terracing of the temenos wall. Later many of these buildings were demolished to proceed with the archaeological excavations in the area, revealing the entire perimeter of the mausoleum of Hecatomnus. Now all these buildings have been completely removed to allow the archaeological inspection of the whole structure [Mancuso and Frascari 2015].

The tomb of Hecatomnus, father of Mausolus can be considered as the archetype of the later architectural wonder, the remaining part of this building defines a large and massive construction, probably used in time both as a quarry of stone pieces and as a solid basement for new edifications.

Inside the tomb chamber, a rich sarcophagus, well preserved and completely sculpted with moments from the life of Hecatomnus is the most important artwork remained “saved” from the thieves. What was inside is now completely disappeared, thus the rich collection of figures creates a very interesting occasion for looking at a distant past and to develop new knowledge about that time.

The interpretation of the figures represented in this “differently preserved” Mausoleum may offer the occasion of some rethinking (or confirm) about the spatial organization of the statues in Halicarnassus, as well as to contribute in giving a possible collocation to some spare fragments.

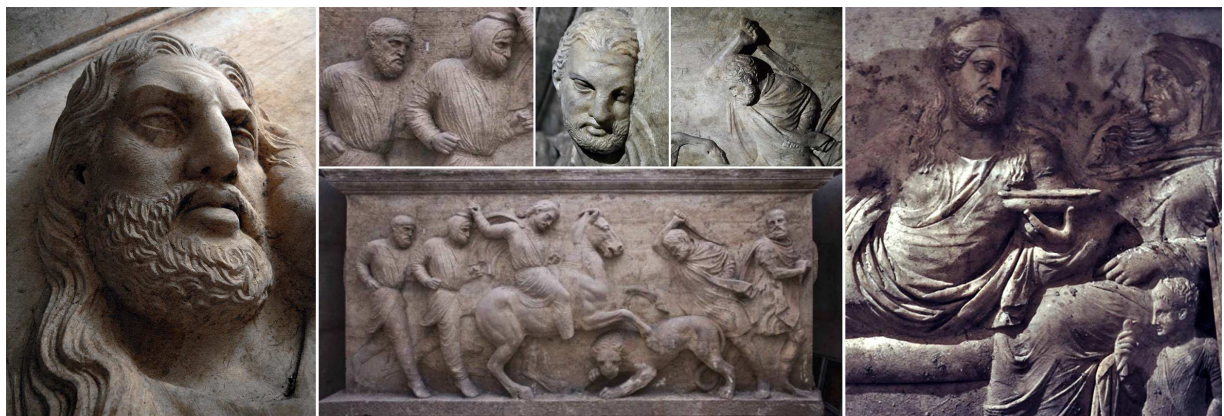


Fig. 1. View from the Hecatomnus' tomb, everyday life scenes and a dynamic moment of hunting (Copyright Nevzat Caglar Tufekçi, wha.com.tr, and www.arkeolojikhaber.com)

GOING BACK TO LONDON

The rich decorative apparatus of the reliefs in the Hecatomnus' tomb gives the opportunity to make some parallel and some comparative speculation between the two mausoleums.

The most important pieces in the British Museum collection consist in the remains of the quadriga, this statue had been placed on the top of the funeral monument, some statues that were placed between the columns of the central part of the building, and some fragmented parts of three friezes. Two friezes, which probably were in the basement, represent an Amazonomachy and a Centauromachy and the third, depicts a racing chariot which was probably above the colonnade [Jeppesen 2000].

Regarding the decorative apparatus at the British Museum, it is worth to say that it is also made of a myriad of small parts, all catalogued in a well-organized archive. In the intention to start a comparative study between certain aspects of the Hecatomnos tomb and the Halicarnassus Mausoleum, it was important to make some choices and define a small set of elements capable to create a first testing ground. The logic of the operation was to identify some possible “parallel” characters and then tries to use the digital modelling/inspection tools to go further in the identification between the people, the subjects, the scenes and maybe some details depicted in this artwork.

Obviously, the operations described in this paper are only the “step 1” of this process, with the processing used to gather a first dataset from the British Museum collection.

To start the process, it was necessary to browse between a very large number of fragments to select the most interesting pieces for this study and for comparison with the other sculpted figures from Milas. After a generic visual inspection of all the pictures available from the Hecatomnus tomb, it was defined the following set of possible subjects: the face and dress of Hecatomnus himself, the dress and pose of the women in the reliefs, the bearded men sculpted more than once all along the sarcophagus, the “masked” hunter (probably a servant) and the pose of the horse and horseman (Hecatomnus) in the haunting scene.

The sculptural elements that have been taken into consideration for our survey at the British Museum are well preserved and easy to access. The two freestanding statues, the so-called ‘Artemisia’ (museum n. 1857,1220.233) and the so-called ‘Mausolus’ (museum n. 1857,1220.232), are the best-preserved elements found during the excavations of Sir Charles Thomas Newton in 1857 and, in the first reconstruction of the Mausoleum, they were placed on the rooftop inside the quadriga [Newton 1862]. Now, Kristian Jeppesen supposed that these statues were not placed in the quadriga because they do not have the same scale as the other rediscovered part (a horse and a wheel). Even if there are not enough elements to award them with any a certainty iconographic meaning these statues represent two people of great authority such as two ancestors of Mausolus [Brian Cooket al. 2005]. This hypothesis is supported by the study of the details of the clothing and of the hairstyles of the statues [Jeppesen 2000 p.172-176; Waywell 1978].

The so-called ‘Mausolus’ statue survives with facial features well preserved so we can underline it has got realistic somatic features (with long hair, full lips, wide cheekbones, beard and drooping mustaches) and a dignified posture worthy of a king. The statue represents a person of great authority and its facial features have a characteristic look that can represent the portrait of an existing person.

The statue of ‘Artemisia’ is reconstructed from several fragments, but much of the face and part of the forearm are missing. The woman wears a long chiton, simple thick-soled sandals and a himation which is drawn up over her head. Her hairs are symmetrically arranged in a triple row of defined curls runs above her forehead while the rest of the hair is covered by a sakko, a tight cap. Other fragments of these female statues have been excavated (in particular three heads) and present some characteristics in common with “Artemisia”, so it is possible to identify them as belonging to the same series. The characteristics of size of “Artemisia” place her statue among the columns of the Mausoleum, where the portraits of family members of the satrap (six men and six women) were placed [McGowan 2013].

The bearded male head (Museum n. 1857,1220.267) is finely carved with a neutral expression but the back and right side of the head are missing. The beard and hair are short and wavy. The rough finish of the hair and beard contrasts with the smooth finish of the facial features.

The marble male head (Museum n. 1857,1220.263) analyzed is wearing the headdress called Kyrbasia, a kind of cap worn by the Persians, which may be recognized in several representations of Satraps in Greek art. This cap is probably made of linen rolled up and secured to cover the mouth and the neck. This type of headgear is also present on one of the sides of the sarcophagus found in the proto-mausoleum in Milas where it is worn by a man from the group of running hunters accompanying the satrap on horseback.

The Persian rider was chosen because the position of the horse, but most of all for the position of the hand (or its remains) clearly catching the bridles. This statue was made on large scale (Museum n. 1857,1220.234, height: 1.16 m, length: 2.15 m, width: 1 m) the man figure was sitting on his prancing horse holding the reins of the horse. The garment of his typical Persian costume appears to blow back in the wind because of the high speed of the ride. The body of the horse has a massive musculature and evident veins while other parts that protrude from the torso (legs, tail and head) are lost. The horse race scene and the attitude of the rider looks like the one represented on sarcophagus re-discovered under the mausoleum in Milas.

The last statue selected was a part of the frieze representing the battles with the Amazons and Centaurs which iconographic meaning is clearly symbolic and mythological and represents the heroic life of the satrap of Caria through his battles [Hoepfner 2013]. The slab of the Amazons frieze (Museum n. 1847,0424.9-10) that has been surveyed represent four figures, a Greek and three Amazons. On the left an Amazon on horseback, raises her right arm over her head and rides down a Greek, of whom practically nothing remains. Her helmet is a Persian type with ear-flaps and double-belted chiton. On the right a Greek, with a pointed helmet over long hair, and an Amazon fight over another fallen Amazon. The fallen Amazon wears a double-belted chiton and the man is about to hit her with a

dagger. The Amazon on the right also wears a chiton and raises her right arm, about to strike the Greek warrior with an axe. In this case the parallel with the Hecatomnus' tomb may appear not according to the statues apparatus, but to the paintings along the walls of the tomb (so wrong they have been seriously damaged by the thieves).

PHOTOGRAMMETRIC SURVEY: SPECIFIC CHARACTERISTICS, SPECIFIC PROBLEMS

The specific characteristics (time available, size of objects, accessibility, etc.) of each photogrammetric survey make it unique and lead to the need of using peculiar shooting techniques and work organization. To get a reliable and complete dataset for further investigation and documentation a high-quality model and, in this case, a high-quality set of pictures is necessary. To realize such a set, there is the obvious condition to avoid not well working shots, like partial/slightly out of focus photos, micro-blurred images and odd lighting conditions (flares, reflections, change in lighting between the shots). Avoiding all these shots means to reduce the conditions that can produce them (with the use of stable supports like tripods and monopods, using manual focusing and stopping-down and being quite quick in all the operations to avoid changes in the general lighting conditions) and so banish the risk to reduce or even invalidate the possibility in obtaining a good quality model.



Fig. 2. The photographic survey at British Museum.

The photogrammetric digital survey was operated in 2014 by an operative unit of the *Dipartimento di Architettura*. In our case the photographic main session took place in the room 21 of the British Museum, which hosts the permanent exhibition about the Mausoleum of Halicarnassus moreover, considering some pieces are not exposed to the public, the survey was also taken place inside the underground deposits of the museum. The survey was conducted using two full-frame DSLR cameras: a Nikon D800 and a Nikon D800e, both equipped with a 36 megapixels sensor and using two lenses: a Nikkor 24-120mm F4 zoom and a Nikkor 35mm F2 prime lens. The photographic quality of these cameras is excellent even in low light conditions and these cameras provide high resolution photographs even at high ISO speeds. The smaller pieces were instead photographed with a Nikon D5100 camera (16 megapixels APS-C sensor) equipped with a Nikkor 18-200mm (F3.5-5.6 VR) zoom lens. The equipment was completed by two tripods and a monopod and a wire remote control for each camera. This survey was characterized by the good accessibility to the pieces assured by the museum staff even if, clearly, it had the general needs of every indoor photogrammetric survey: remote triggers (to reduce the risk of shaking the camera at the moment of the shot causing blurred images) tripods and monopod to allow the use of slow shutter speeds and, in the case of the monopod, also to reach some more difficult part of the statue (like the top part of the heads). In general, attention was paid to the dual lighting present in the room: spotlights and natural zenithal lighting (due to the skylight), trying to prevent lighting changes during the photo session and lens flare due to the artificial light spots. The specific problems of the survey included the height of the statues conventionally identified with 'Mausolus' and 'Artemisia' which required some photographs from an elevated position (reached with the use of a staircase kindly offered by the British Museum) to well represent the head of the statues. Because of the use of the staircase with the camera mounted on the monopod, here it was preferred the use of the Nikkor 35mm F2 (smaller, lighter and so easier to manage with the camera mounted on the pole). For the 'Persian rider' the main difficulty was the proximity of one side of the statue to the wall, in this case the use of a wide-angle lens (the 24-120mm zoom widened at 24mm) with a generous stopping-down was strategic to complete this survey work.

Last but not least, for each subject a series of measurements were taken directly in place, from rigid and well recognizable elements, so to allow the later scaling of the models according to one or more "scale bar" using the specific procedure in Agisoft Photoscan.

THE POST-PROCESSING AND THE 3D DIGITAL MODELS

The process of creation of the 3D models was done using Agisoft Photoscan, this software was used in its well consolidated workflow, aimed to produce accurate 3D models with full texturing. The process was applied for all the picture sets, producing models with various complexities (due to the articulation of each statue). Just to consider two cases: the statue of the “Persian rider” was covered with 212 photos; it has produced a sparse point cloud made of 3.323.415 points and a further mesh of more than 1.2 million of faces, while the dense cloud was about 24 million of points and produced a raw mesh of about 47 million of faces.

The single group of pictures taken to create a detailed model of the head of the “Mausolus” statue required 46 photos, generating a sparse point cloud made by 271.351 points, while the dense cloud was about 26 million of points and produced a raw mesh of about 5 million of faces. All the models obtained went to a following post process sequence, where the surfaces were cleaned and optimized.

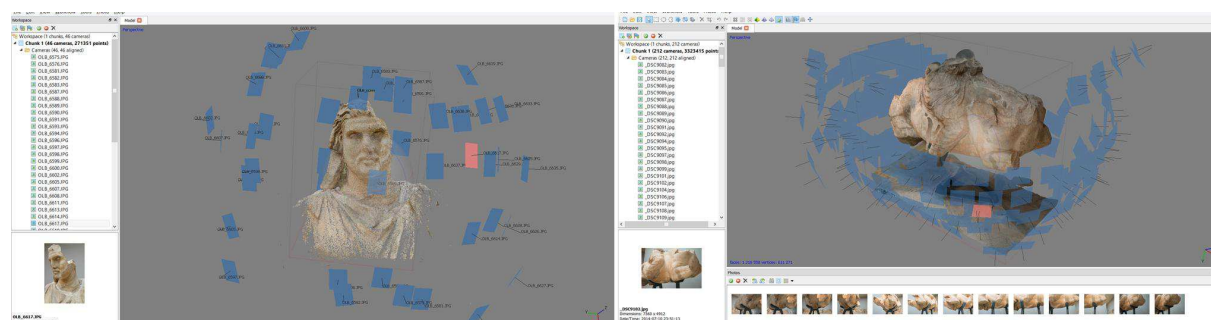


Fig. 3. Screenshots taken from Agisoft Photoscan, showing two models during the photogrammetric processing of their whole set of pictures.

All the models were saved in their original version and then decimated and elaborated to smooth the surfaces and close all the holes. The main workflow after completing the photogrammetry was: export in OBJ format check/repair, holes filling and decimation in Raindrop Geomagic Studio 2013. Then the mesh was exported back to Photoscan to have the building of the final texture. The final textured model was then exported again in OBJ format and imported in Autodesk 3D Studio Max to allow the production of rendering view and orthographic representations. Each 3D model was then exported to the sketchfab.com system, using the dedicated plug-in from Autodesk 3D Studio Max. All the exported models to this interesting and well working 3D service were decimated in a range between two million and 180 thousand of vertices. The intention was to produce a set of models fully usable for different needs (multimedia, rendering, online presentation) and with a common quality level. In this way a freely shareable digital base to see, make comparisons and try an accurate reading of the sculptures from Halicarnassus was created. The results, edited and optimized at different resolutions for online presentation were ready for further usages, like the implementation in the multimedia database of the pieces available to everyone through the portal Sketchfab.com. The well-known service offered by sketchfab.com is one of the best solutions for this operation. The fluid 3D system, the easy to use interface, the possibility of embedding the contents in other website/social network the option to use it on personal devices, the always ongoing enhancements, the possibility to have “automatically” a VR immersive visualization, are just a part of the long list of features that makes this solution well appreciated by a large number of operators in Digital/Cultural Heritage [Friedland 2015]. All the models from the photogrammetry process were so uploaded to the sketchfab.com website, using directly the Autodesk 3D Studio Max plug-in. All the uploaded items received a set of metadata to help the researches and a brief generic/technical description. In the end, the group of models was organized in a single “collection” to have an easier access from the research group and for external users.

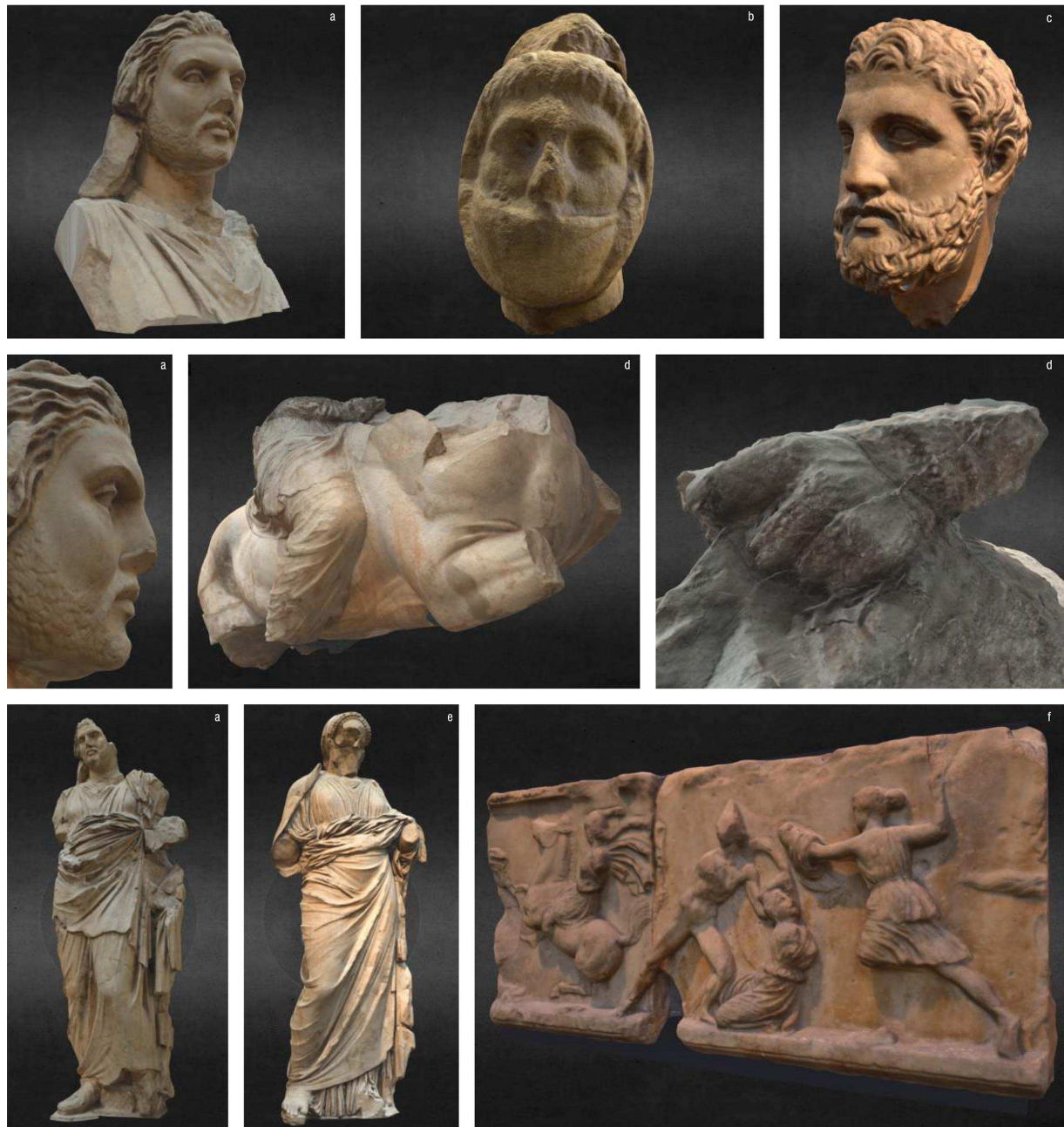


Fig. 4. The digital versions of the statues from Halicarnassus at the British Museum, edited for Sketchfab.com. The statue “a” is the male figure commonly indicated as “Mausolo”, the “b” is a masked man head, similar to some figures in the relief of the Hekatomnos sarcophagus (Haunting scene), the “c” is a bearded man head, again with some similarities to other characters from the older tomb; the “d” is the torso of a horse with riding horseman; the “e” is the female figure commonly indicated as “Artemisia”, the “f” is a scene of the battle with the Amazons freeze. The whole set of 3D models are viewable at the following link:

https://sketchfab.com/g.verdiani_DIDA/collections/the-alikarnassos-mausoleum-at-the-british-museum.

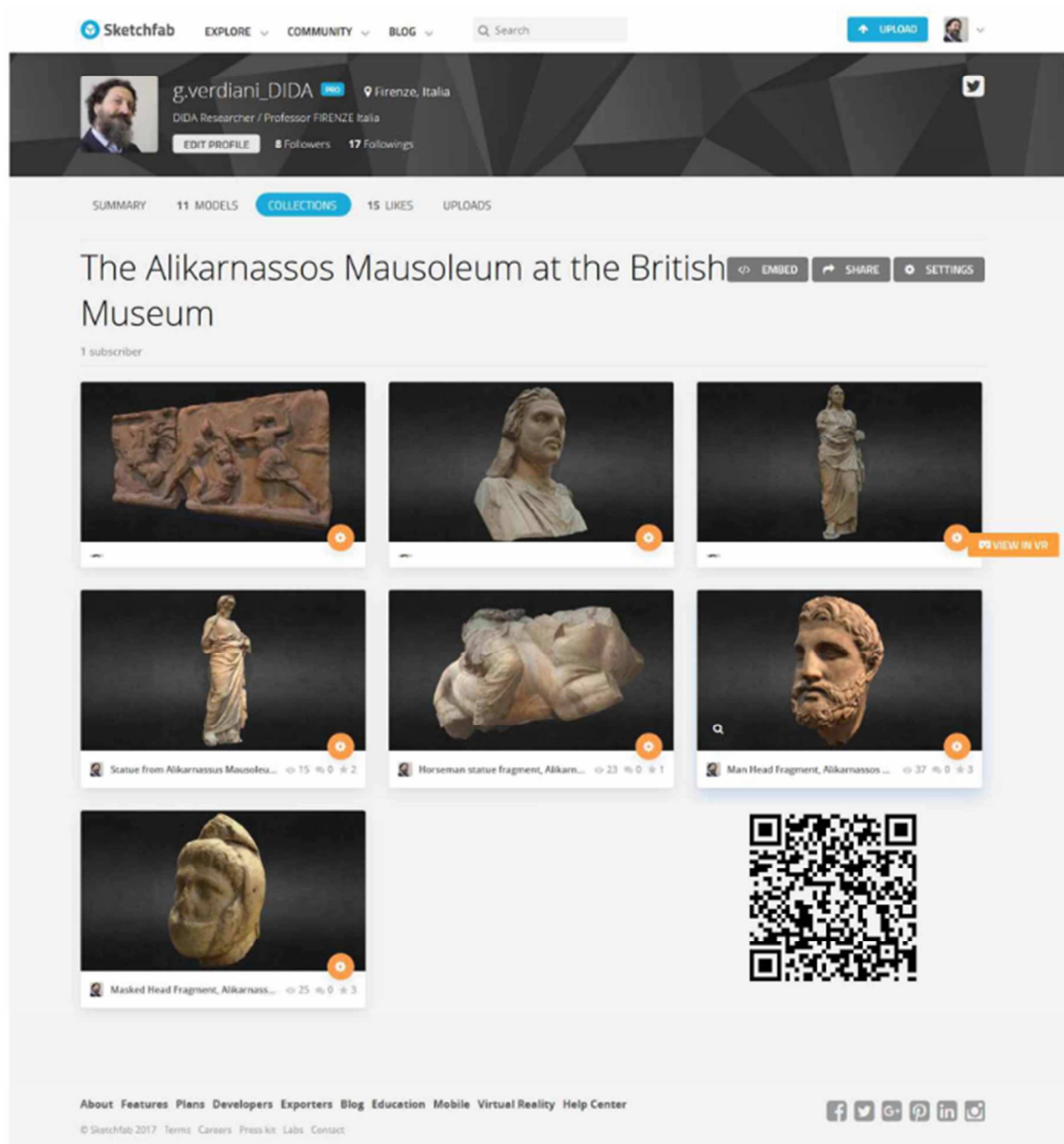


Fig. 5. The Sketchfab collection (the QR code is inserted for printed/poster presentation on a screenshot taken from the web page).

ANALYSIS OF THE STATUES AND BEYOND

Going back to the main subject of the research, the accurate 3D models allow a rich set of complex operations, were one of the most useful and simple is the virtual survey and analysis of the statue. This process is now still at its first passages and as a first operation it was chosen to operate a detailed check about the unit of measurement and proportions of the statues. It is worth to say that to begin this work it was important to identify the correct unit of measurement according to the time and place. The rich set of anthropometric measurement units from the past may create a very odd condition in finding the right one [Kula 1986], but the previous studies can be a clear and useful

trace to follow. To start, it was taken in analysis the marble statue so-called 'Mausolus' (Room 21 British Museum, London, Museum n. 1857,1220.232, excavated by Sir Charles Thomas Newton, acquisition date 1857), it was compared with the unit of measurement that were supposed in the report of the Danish expedition [Jeppesen 2002 p.47] in Bodrum, ancient Halicarnassus, for the realization of the Mausoleum.

In these reports the measures taken during the excavations have been compared one to each other, with other contemporary buildings and with the descriptions of the building made by Plinio and Vitruvius.



Fig. .6 The head of a bearded man and the man wearing the Kyrbasia, image rendering in Autodesk 3D Studio Max from the photogrammetric models.

The two units of measurement that are most corresponding to the data are:

1 foot (15-16 dactyls) = 30 cm

1 foot (15-16 dactyls) = 32 cm

Comparing these units with the so-called statue of Mausolus, there is a good correspondence with the height of the statue that is approximately 13 feet (considering a 'foot' equal to 30 cm).

Such a reflection is not secondary, while the identification of a common measuring unit may allow to extend the same, or similar, grid to a larger area and define the proportions for the other statues (especially for the missing parts) and of the architectural apparatus.

The next step in this part of the research will be the overlapping of these same grids over the other statues and parts and at the same time the test of possible grids with other measuring units and check them back across this small collection.

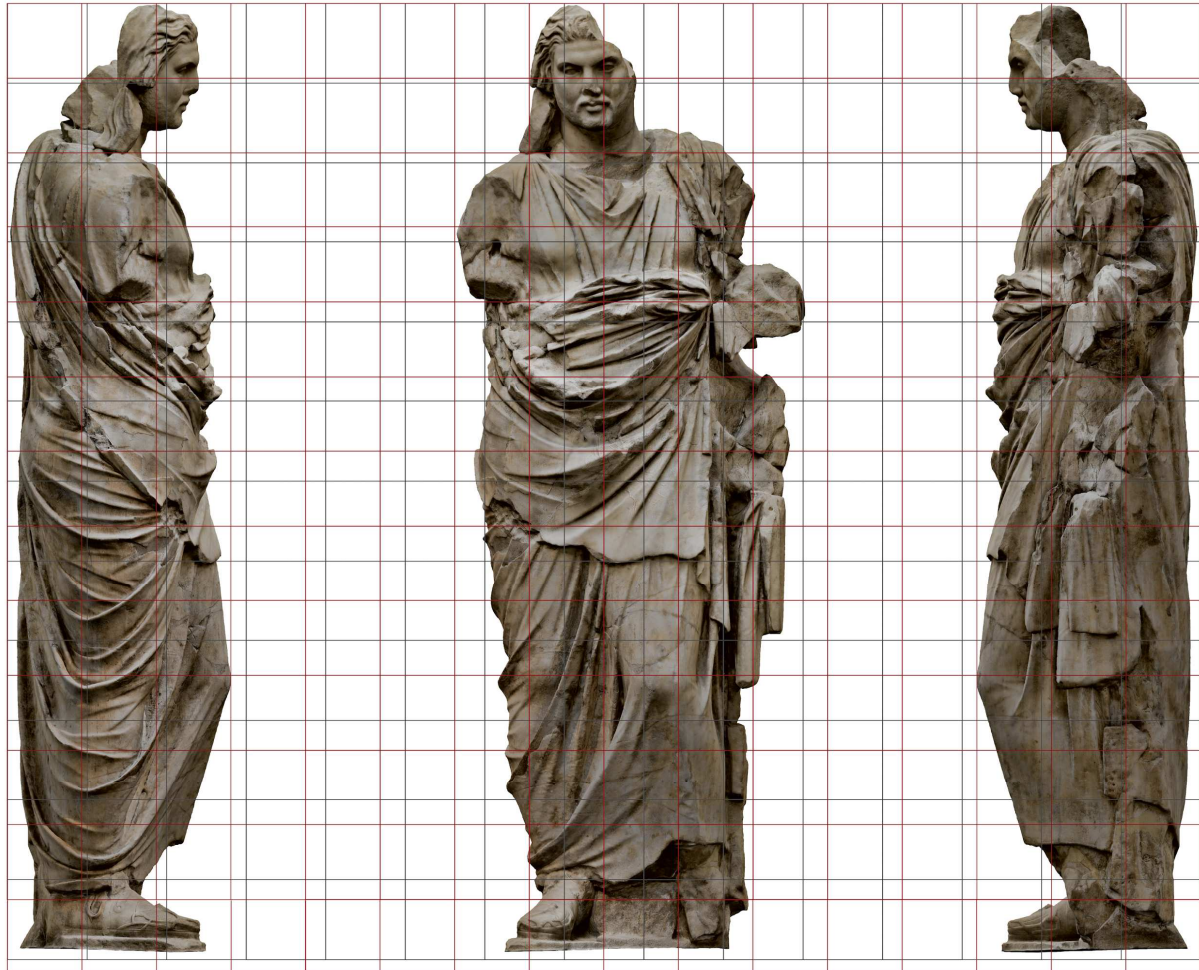


Fig. 7. The so-called ‘Mausolus’ Room 21, British Museum, Museum n. 1857,1220.232, front and side views from the photogrammetric 3D model overlaid by two-dimension grids. In black: 1 foot = 32 cm, in red 1 foot= 30 cm).

Is it true that all the “complete” statues from this collection are reconstructed from fragments, and so it is possible that some small variations may be happened in putting all the part together, but it can be considered marginal, something not influencing the possibility to develop efficient ratios and grids about the guiding structure of these artworks.

Such a procedure can be in the future useful to help in finding some correspondence in the sparse fragments, or at least in having a better idea about the asset and aspect of the sculptural apparatus of the Mausoleum. And the suggestions can go even further, with reflections about proportions, styles and relationships with architecture to better understand and verify possible new reconstruction choices about this long lost architectural wonder.

With the general analysis of the architectural structure of the mausoleum in Milas, a clear archetype of the “wonder of the ancient world”, it would be possible to understand something more about the lost monumental tomb, a simple check about the massive size of both the lots and buildings allows to intuit a possible ratio worth of more in depth studies. So, a next use of accurate surveys from Milas should be a useful part of an ongoing research.

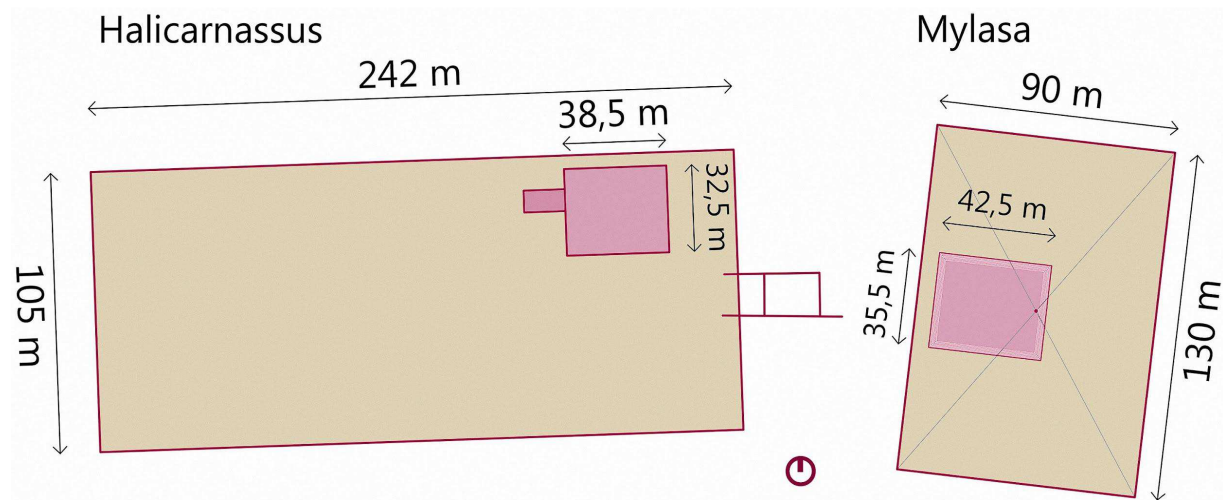


Fig. 8. Schematic plan view of the Mausoleum in Halicarnassus and in Milas, main size and orientation.

CONCLUSIONS

The use of photogrammetry based on the Structure from Motion (SfM), is nowadays a very popular method to operate an efficient and affordable digital survey. This procedure takes advantage of the ongoing innovation in digital camera features (like the full-frame 45.7 megapixels sensor of Nikon D850 or the medium format sensors ranging around 50 megapixels) and of the continuously improving computing power, having benefits from software and hardware enhancements, to create a quite short workflow for producing usable 3D textured models. It is possible to consider this solution as a very powerful tool, balanced between traditional and innovative features and available for multiple purposes and needs but with the option to be efficiently inserted in the general workflow of any research about Cultural Heritage subjects. This study is another demonstration of the efficiency of the photogrammetric procedure: lightweight tools, quick operational processing and possibility to reply the model production according to the evolution of the software.

The will to define a reconstruction of this monument is strong across this century, the medal of the “Ancient World Wonder” shines and capture the interest of many scholars, thus the high level of uncertainty about the effective aspect of this monument cause the absence of a final solution. But any step by step process guided by the logic of dissemination and sharing can be worth of a try.

The next step in this research should be the enrichment of the collection of photogrammetric survey from the British Museum, with some more pieces, especially the architectural ones, like the capitals. In this way, the photogrammetry taken from the British Museum and those from the Milas sculptures should be matched in a detailed way, allowing a better understanding of the possible integrations and completions of both the set of masterpieces. In the end a survey of both the complex of ruins would be the perfect base for completing the analysis and develop a gradual (and scientific) virtual reconstruction of the two ancient monuments. Considering that, at the site of the Mausoleum, the only remains are the foundations, the realization of digital models of the pieces better preserved and more interesting of the mausoleum, which can be found in several places (British Museum, or embedded in the outer walls of the castle of the Knights Hospitaller (Knights of St. John) in Bodrum and in the Mausoleum museum, it's useful for the possibility to put together, as a puzzle, all the pieces of the building, for all interested researchers and scholars around the world. Sooner or later, the parallel between the Mausoleum at Halicarnassus and the archetypical mausoleum in Milas, will be accurately studied and defined, connecting the architectural heritage, now in ruins, left by the Hecatomnid dynasty.

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